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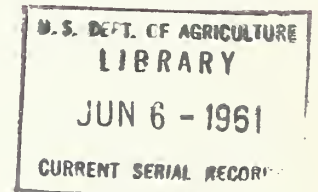
Early Occurrence of Moose

on the Kenai Peninsula and in other

sections of Alaska

by

H. J. Lutz



ALASKA FOREST RESEARCH CENTER
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FOREWORD

One of the incidental benefits of the work of Dr. Harold Lutz on forests and fires in Alaska is this treatise on the occurrence of moose in Alaska. To recognize the importance of these historical references is significant but to laboriously interpret, translate and document them is a greater tribute to the patient scholarly work of Dr. Lutz.

The degree of fantasy of "old wives tales" in a country appears to be in direct proportion to the primitiveness of the country. Alaska continues to abound with stories yet to be shown untrue. That the moose is a newcomer to Alaska is still being repeated but Dr. Lutz exposes a record to the contrary. For those willing to study the record it is clear that moose are not a recent part of the Alaska fauna.

This work will serve as a valuable reference to future forest and wildlife workers.

Urban Le Nelson

HISTORY OF THE EARLY OCCURRENCE OF MOOSE ON THE
KENAI PENINSULA AND IN OTHER SECTIONS OF ALASKA

By H. J. Lutz^{1/}

INTRODUCTION

During the course of work in the forests of the Kenai Peninsula, Alaska, dating as far back as 1925, I became interested in the history of the occurrence of moose in that region. At first the interest had no objective other than satisfying personal curiosity. But as information from widely scattered and often obscure sources accumulated, it appeared that a comprehensive review of the history of the early occurrence of moose on the Kenai Peninsula, and in other sections of Alaska, might be of interest to others. The following account was prepared with this thought in mind. For the most part I have not attempted to carry the record later than 1900 because the history of moose in Alaska since then is fairly well known.

The Kenai Peninsula (fig. 5), an area of about 9,000 square miles, lies mostly between longitude 148° and 152° West and latitude 59° and 61° North. It is bounded on the west by Cook Inlet, on the east by Prince William Sound, on the south by the Gulf of Alaska, and on the north it is connected to the mainland by a strip of land about 11 miles wide between Turnagain Arm and Passage Canal. The pass from Passage Canal to Turnagain Arm is about 700 feet above sea level. From earliest time the route from Passage Canal to Turnagain Arm furnished a means of communication between the upper parts of Prince William Sound and Cook Inlet.

TRADITION OF LATE ARRIVAL OF MOOSE ON THE KENAI PENINSULA

The tradition that moose were either unknown or very scarce on the Kenai Peninsula up to about 1875 is encountered repeatedly. Of the writers who regarded moose as comparatively late arrivals on the Kenai, some placed the time of first appearance a little earlier, some a little later.

In 1900 De Weese (¹⁶),^{2/} who had hunted moose on the Kenai Peninsula in 1897, 1898, and 1899, wrote as follows: "The advent of moose in western Alaska has been very recent. During my three hunting trips there I have made such inquiry from the old fur traders and from the natives and Indians. Twenty-five years ago moose were not known in the Kenai Peninsula, nor in the Kuskokwim country, and the first one was seen as far as Katmi as late as ten years ago." This statement is, so far as I can determine, the first published opinion that moose were at one time unknown on the Kenai and that they moved into the

^{1/} The author is Professor of Silviculture, School of Forestry, Yale University, New Haven, Conn. Much of the information presented was obtained in connection with forest research studies he conducted for the Alaska Forest Research Center, Juneau, Alaska.

^{2/} Underscored numbers in parentheses refer to "Literature Cited," page 20.

region around 1875. Writers earlier than De Weese gave no indication that either they or the natives regarded moose as comparatively late arrivals in the Kenai region.

The Indian tradition of the late arrival of moose on the Kenai Peninsula recurs in various subsequent reports (5; 7, pp. 151-152; 11; 12; 19; 20; 21; 26; 32; 39; 40; 41; 47; 64; and 65) from 1901 to 1950.

The so-called King's County Expedition, a group of miners who arrived on the Kenai Peninsula in the fall of 1898, is occasionally mentioned in connection with the view that moose appeared in the region comparatively late. Eddy (19) stated that "The King's County Argonauts have left records regarding their difficulty of finding any moose" but prolonged search for such record has been unavailing. In referring to a report by Dufresne made in 1933, Hosley (22) presumably had the King's County prospectors in mind when he stated that "In the Skilak Lake area (Kenai Peninsula), Alaska, in 1898 a gold mining expedition was able to kill only one moose during the winter" I have heard residents of the Kenai Peninsula relate that members of the King's County Expedition were unable to find any moose; this was advanced as evidence of the scarcity or absence of the animals in 1898.

That a group known as the King's County Expedition existed cannot be doubted. Bennett (7) heard the story on the Kenai Peninsula in 1916. The Brooklyn Eagle for January 31, 1898 contained brief mention of the sailing of an expedition to Alaska aboard the ship Actaea; the paper did not, however, call it the King's County Expedition. In describing the Expedition's travels, Bennett (7) mentioned: "With burdensome supplies and without knowledge or adequate means of traveling here in winter, the party succeeded in reaching the shores of Skilak Lake after severe hardships, where cabins were built at the mouth of King's County Creek." Presumably some of the "burdensome supplies" carried were goods mentioned by Eddy (19)---". . . all kinds of pioneer articles, such as two hundred looking glasses, five barrels of door knobs and several large meat chopping blocks." The alleged lack of success of the King's County party in hunting moose should not, it would seem, be taken as evidence that the animals were at that time very rare on the Kenai. As will be shown later, trophy heads of moose had been taken from the Peninsula before the ill-fated expedition had even left New York.

Palmer (42), in an account of the Kenai moose area, reported heavy browsing of palatable shrubs in the Skilak-Tustumena Lake region; in the willows, especially, this resulted in coppice growth and bushy deformed tops. He wrote, "The exception is in the case of a relatively few tall growing (20 ft. to 25 ft. high) tree willows that have grown up beyond reach of the animals, this undoubtedly occurring shortly after the fire [said earlier to have been reported in 1883] and before the first income of moose to the area. (First moose are said to have appeared on the area in 1898). This is verified in the fact that several representative trees cut down and examined showed an age of 40 to 50 years." In a report (43) published in 1938, Palmer discussed the history of the Kenai moose range, having obtained his information from Andrew Berg, and others. Palmer wrote: "Andrew Berg (trapper) came into the Tustumena Lake country in 1890 . . . Mr. Berg reports that there were practically no moose in the Kenai area when he arrived in 1890, but the woodland caribou were plentiful and wolves numerous. The first moose landed on Point Possession [on the north side of the Kenai Peninsula, at the entrance to Turnagain Arm] . . . on October 10, 1871."

Dufresne (18) stated that, "In the year of 1883 a forest fire raged for months on the Kenai Peninsula. Shortly thereafter the caribou herds vanished. Coincident with this rapid passing of the caribou appeared the moose which were practically unknown on the Kenai before the big fire. Today not a single caribou exists on the Peninsula, but the place is world famous for its moose herds."

The literature indicates that the tradition of late arrival of moose on the Kenai Peninsula is of Indian origin. The time when moose first appeared, or the time prior to which they were "practically unknown," varies with the writer. The majority of reports place the date of appearance of moose in the 1880's (5, 12, 18, 39, 41). Those who placed the date of appearance in the 1870's include De Weese (16), Bennett (7), Eddy (19), and Palmer (43). From the writings of Strong (65) a date around 1815 may be inferred; from Lucas (32), a date some time between 1832 and 1877; and for the Tustumena Lake-Skilak Lake area a date as late as 1898 (42).

From whence did the moose come? De Weese (16) thought their movement to the Kenai Peninsula occurred about the time of the Cassiar gold rush in British Columbia; the Cassiar region, according to De Weese, was a great moose country and with the entry of large numbers of miners the moose were thought to have moved out, finally reaching the Kenai Peninsula. Cane (12) had the moose cross the narrow isthmus at the head of Turnagain Arm. Shaw, quoted in the report of Strong (65) had the moose come from the Iliamna country. Palmer (43) presumed that the first moose that landed on Point Possession came from across Cook Inlet.

EVIDENCE OF EARLY OCCURRENCE OF MOOSE ON THE KENAI PENINSULA

At an early date the speech of the Kenaian Indians included a word for moose, indicating familiarity with the animal. The native word for moose, tanakā, was recorded by Davydov^{3/} (14), Kruzenshtern (25), and Schiefner (57). The latter also included the native word ttanakē which, according to Doroschin^{4/} (17) likewise referred to moose. Words for both moose and caribou were included by Schiefner.

More direct evidence is found in some of the early Russian reports. Wrangell (71) stated that moose were found very occasionally west of the Copper River, to Cook Inlet, and in the valleys draining into the Chugach Gulf (an old name for Prince William Sound) and Cook Inlet. Brandt (8) reported that Vosnessenski^{5/} personally informed him that he had encountered moose from the Bay of Kenai (the Russian name for Cook Inlet) and the Alaska Peninsula, northward to Kotzebue Sound.

There is a disappointing scarcity of early accounts of the Cook Inlet country by Americans. This lack was recognized long ago by Dall (13), who pointed out that Cook Inlet was hardly mentioned in the literature outside of Coast Pilots and marine directories. There are, however, a number of reports that seem relevant. Truman (66)^{6/} remarked on the resources of the natives of "Upper Kany" (evidently the village now known as Kenai). . . " with the few vegetables they raise; salmon, which here are very fine; and game, which abounds on the mainland of Alaska; deer, reindeer /caribou/, grouse, and many

3/ Davydov was in the Cook Inlet region between 1802 and 1807.

4/ Doroschin ascended the Kenai River in both 1850 and 1851.

5/ Vosnessenski, Conservator in Kaiserlichen Jagdpavillon zu Lissino; was in Alaska during the period 1842-1844. His name is commemorated in Vosnesenski Glacier, near Kachemak Bay, at the south end of Kenai Peninsula.

6/ In the summer of 1869, Major Ben C. Truman accompanied Captain Kohl, owner of the steam yacht Fideliter, on a trip to Alaska.

"Bears & Moose." In his journal article, (61) he wrote that, "The Kenai Peninsula, or rather the Kaknu River [an old name for the Kenai River], was prospected by Lieutenant Doroshin in 1850; and Ivan Petroff also ascended this river by canoe to the chain of lakes at its head. Bears and moose, mountain goats, and reindeer abounded in numbers" Seton-Karr also described a journey made by Petroff from the head of Turnagain Arm across the isthmus to Passage Canal in Prince William Sound. "The way lies on two glaciers most of the distance, ascending one of them to the point whence they divide, and then descending the other. It was May, and just at this point he [Petroff] met a large herd of moose."

Porter (50) presented an account of the population and resources of Alaska at the Eleventh Census in 1890. Following a discussion of Resurrection Bay, on the southeastern shore of the Kenai Peninsula, Porter wrote, (p. 68), "The open uplands and the swampy valleys and poplar thickets are still frequented by droves of moose and cariboo" On p. 70, writing further of the Kenai Peninsula, Porter continued: "The forests and valleys of this region are still filled with numerous droves of moose, as well as with martens, foxes, lynxes, black bears, marmots, and porcupines, and furnish a rich hunting ground for the Tnainas of Nikishka and Kenai." Nikishka was a native village near the East Foreland, some 12 miles north of the village of Kenai. Porter twice used the word still, with the connotation that moose occurred in "droves" to that time, or yet. One would not expect this language had Porter regarded moose as recent arrivals in the region.

The January 23, 1897 issue of Forest and Stream (1) carried a note to the effect that W. W. Hart of New York City had received a large moose head from Alaska, the antlers having a spread of 70-1/4 inches. The source of the trophy was given as thirty miles back from Cook Inlet. The January 30, 1897 issue (p. 65) of the same journal carried a photograph of the head. An even larger specimen, possessed by W. F. Sheard, a dealer in Tacoma, Washington, was described and figured in the March 6, 1897 issue of Forest and Stream (2). This head had a spread of 73-1/4 inches; the source was indicated as the Yukon River but actually it came from Cook Inlet as will be shown presently.

A letter written by Dall De Weese to friends at his home in Canon City, Colorado, and published in 1898 (15), is of particular interest in connection with the early history of moose on the Kenai Peninsula. The letter carried the heading: "Head of Kusilloff River, Cook's Inlet, Alaska; Moose Camp, September 9, 1897." De Weese wrote " . . . I visited in Tacoma and learned that that big moose head whose picture I showed you last winter in Forest and Stream of March 6th had come from Cook's Inlet instead of the Yukon" (The photograph referred to by De Weese showed moose antlers with a spread of 73-1/4 inches, owned by W. F. Sheard of Tacoma.) De Weese reached Tyonek in upper Cook Inlet in August 1897 and " . . . learned from the fur buyer of that country that a Mr. Berg had killed that big moose mentioned in Forest and Stream, and that he was working at a fish cannery at the mouth of Kusilloff River" De Weese went to Kasilof where he found Berg and after talking with him decided that " . . . he was a good hunter and knew where the moose lived" With Berg and three Indians, De Weese ascended the Kasilof River and established a base camp at the head of Tustumena Lake. He killed three moose (antler spread 58, 64, and 69 inches), Berg killed one, and seven more were seen. A view of the largest head obtained by De Weese is shown in figure 2. With respect to this moose, De Weese stated that "Mr. Berg says the horns are more massive and heavier than the record head he killed two years ago." Evidently Berg was referring to the head with an antler spread of 73-1/4 inches that later came into the hands of W. F. Sheard of Tacoma and was described and figured in the March 6, 1897, issue of Forest and Stream.



Figure 2.--Antlers of moose killed by Dall De Weese near the head of Tustumena Lake, Kenai Peninsula, Alaska, September 7, 1897. Spread of antlers, 69 inches; 32 points. From De Weese (15).

Large moose heads continued to be brought out of Alaska to meet the demands of commerce. The following letter was written by W. F. Sheard, (62) dealer in heads: "Tacoma, Washington, Oct. 1.--Editor Forest and Stream: In your issue of March 6, 1897, you showed cut of a pair of moose horns belonging to me that spread 73-1/4 in.--at that time the largest moose head on record. I have the pleasure of sending you photograph [fig. 3] of a set of moose horns that break all previous records, and stand today the largest and most massive moose head on record. Spread of horns is 78-1/2 in.; width of blades following the curve 18 in., with 40 prongs, four of the prongs on the under side not showing in photograph. . . . I have some seventy-five moose heads, and have handled and seen hundreds of them, but this discounts by far any moose head I have ever seen."

Further indication of the traffic in moose heads from the Cook Inlet country in the 1890's is supplied by the following note (10). Evidently the animals were killed in 1898, or earlier. "Wm. W. Hart & Co. have received a remarkable shipment of game heads from the Cook's Inlet country of Alaska. It includes the heads, horns and scalps of twenty-two moose The moose were all very old bulls. The horns are unusually massive and range in spread from 4 ft. to 70 in."

In 1898 Lee killed two moose near the head of Sheep River, tributary from the east to the head of Kachemak Bay. "On our way back to camp I could have killed two others [moose] one of which had a much finer head than the one I had just secured, but nothing could induce me to kill them" (29). Figure 4 shows one of the moose killed by Lee.

Reports that the King's County Expedition found moose scarce or absent are surprising in the light of Lee's success in the same year and his statement that ". . . the game is wantonly killed by market hunters every winter" Wanton destruction by market hunters every winter would scarcely occur in a region where moose were lacking or few.

Evidence that moose were abundant on the Kenai Peninsula in 1898 is also afforded by other reports. Russell (56) wrote: "I also brought out three other heads and scalps [of moose] unmounted, one the record moose head of the world as to size, beauty and massiveness, spreading 73-1/2 in. . . . While I was at Sunrise City [on the north side of the Kenai Peninsula] the Indians brought in several moose calves, having killed the mother moose." Miller (35) described the moose of the Kenai Peninsula as Alces gigas Miller. The type was an adult male taken on the north side of Tustumena Lake, in September, 1898. Miller wrote: "The Moose of Alaska has long been known to be the largest American deer, but hitherto it has not been directly compared with true Alces americanus. During the summer of 1898 Mr. Dall De Weese, of Canon City, Colorado, spent three months on the Kenai Peninsula in quest of large mammals for the United States National Museum. Of the Moose, the special object of his search, he secured four males and two females." De Weese published a short account (16) of his second (1898) moose hunting trip to the Kenai Peninsula. Mendenhall (34) and Learnard (28) both reported that moose were abundant on the Kenai Peninsula in 1898.

Archaeological evidence secured by de Laguna (26) from a native village site on Yukon Island, in Kachemak Bay, shows that moose were known there at a very early time. Moose bones were found in four layers (Period I, II, sub-III, and IV) representing four periods of habitation. Based on radio-carbon evidence^{7/}

^{7/} Personal correspondence from Dr. Elizabeth K. Ralph, C-14 Laboratory, University of Pennsylvania. The dates given above are being published by Dr. Froelich Rainey and Dr. Ralph in a paper "Radiocarbon dating in the Arctic," submitted to American Antiquity.

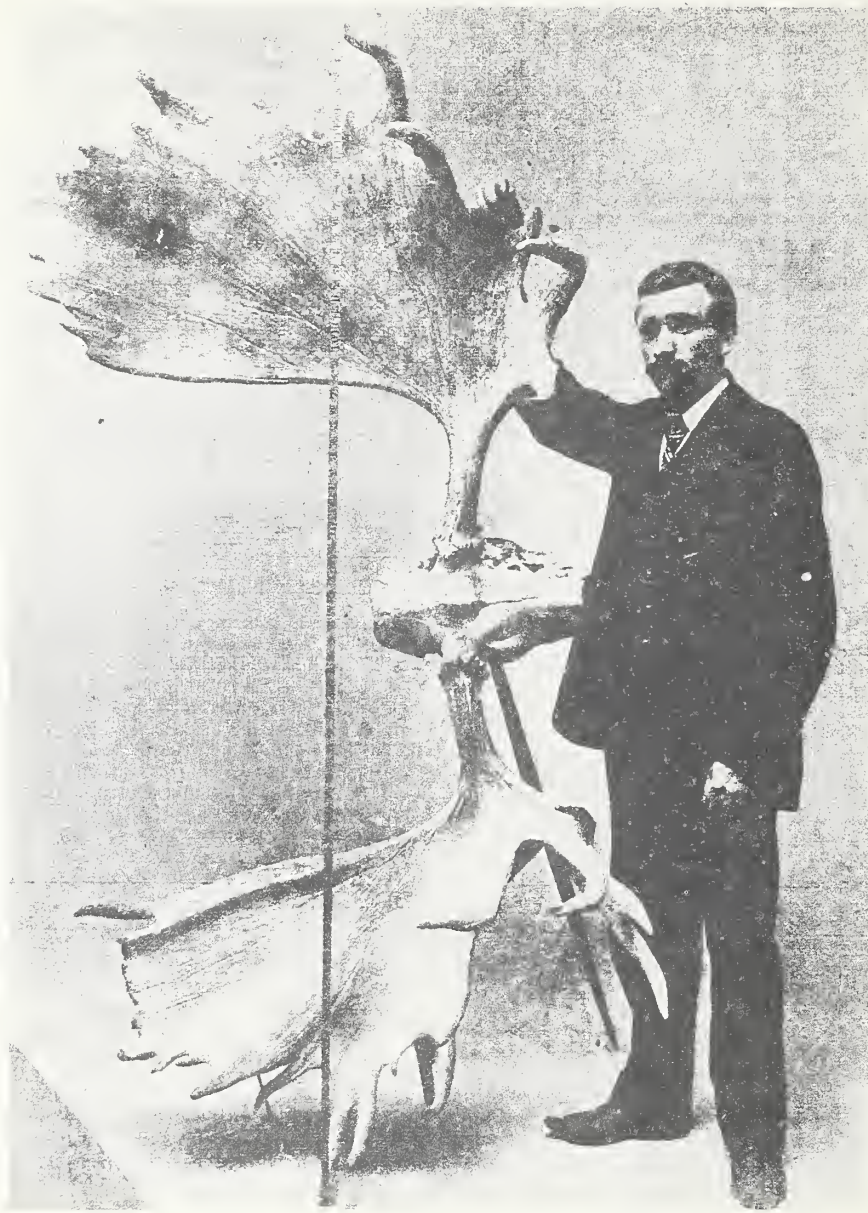


Figure 3.--Alaskan moose horns, spread $78\frac{1}{2}$ inches.
The tape measure records, from tip to tip, 6
feet 6 inches. From Sheard (62).

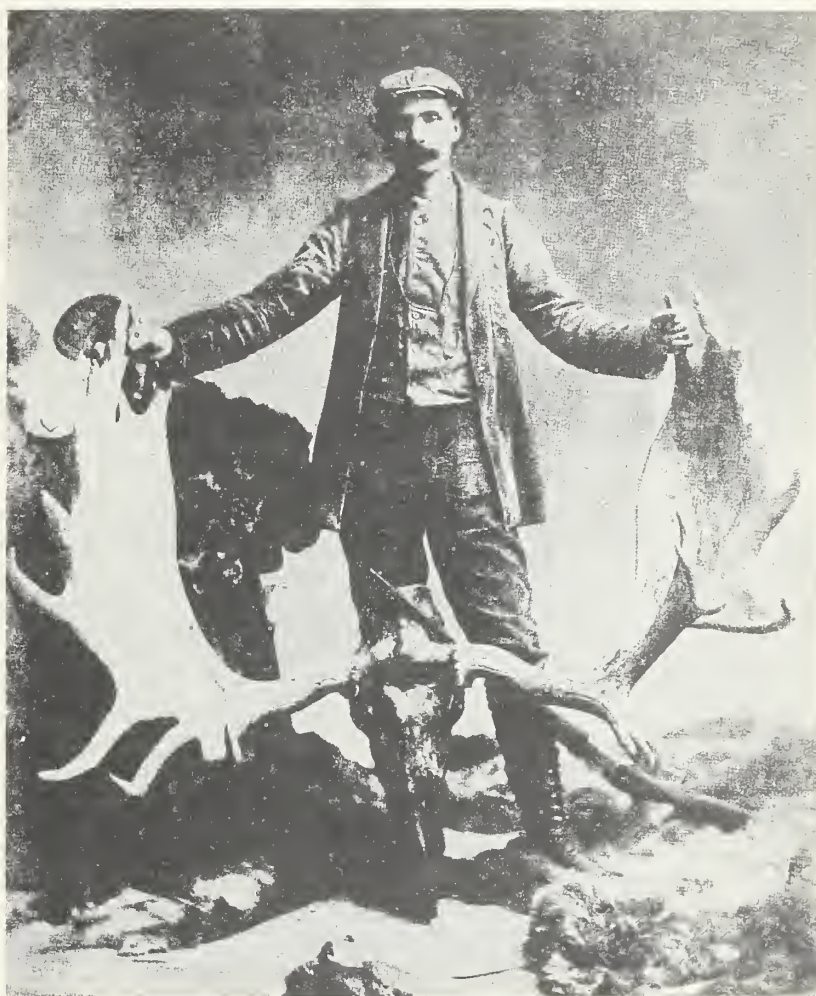


Figure 4.--Moose killed in Kachemak Bay section,
Kenai Peninsula, Alaska, by Harry E. Lee in
1898. From Lee (29).

Kachemak Bay Period I dates B.C. 748 and Kachemak Bay Period III dates A.D. 589. These dates, based on antler material, are regarded by Dr. Elizabeth K. Ralph as erroneously young; the date A.D. 231 is regarded as more reliable for Kachemak Bay Period III. The latter date was obtained from the core of a house post (of Kachemak Bay Period III) from the Palugvik site, Hawkins Island, Prince William Sound. de Laguna (26) wrote (p. 13): "The moose is said to be a recent migrant to this region, where the species is now well represented, but archaeological evidence shows that the moose was known here at an early time, also."

Evidence of the early occurrence of moose on the Kenai Peninsula comes from a variety of sources: the speech of the Kenaian, which included words for moose as well as for caribou; reports by Russians and others who visited the region; and discovery by de Laguna of moose bones in an ancient native village site during archaeological work on Yukon Island in Kachemak Bay.

The view that moose first made their appearance on the Kenai Peninsula in 1871 or thereabouts and that they were rare up to as late as 1898, seems untenable. That fluctuations in the moose population occurred is certain, and it may well be that local scarcity, or even absence, led to reports of general scarcity or absence. The fact that absence is far more difficult of proof than presence is not always appreciated.

HISTORY OF EARLY FOREST FIRES ON THE KENAI PENINSULA

Occurrence of forest fires has frequently been mentioned as a cause of the movements of moose. Fires on the Kenai Peninsula in the last quarter of the nineteenth century have been considered by some writers a principal cause for the appearance of moose in the region.

The history of early forest fires on the Kenai is scanty. So far as I can determine the first written account of a forest fire on the Kenai is that of a Russian mining engineer, Doroschin (17). In the summer of 1851 Doroschin's prospecting was interrupted by a forest fire in the valley of a stream

(the Tusli-tnu) flowing into Skilak Lake (Ka-studilinbna). I am unable to identify the stream called the Tusli-tnu, but it seems likely that it was one of the creeks entering Skilak Lake from the south or perhaps the east.

Mendenhall (34) was on the Kenai Peninsula in 1898 and in traveling up Quartz Creek, enroute from Kenai Lake to Sunrise, on Turnagain Arm, wrote that "Much of the district has been burned, and dead and blackened alder snags impeded our progress and made much of the journey very laborious."

Radclyffe (51) noted that "For an area of many miles around the camp [between Tustumena and Skilak Lakes, about 8 miles north of the former] a great forest fire had devastated the country many years before."

Bennett (7) worked on the Kenai Peninsula in 1916 and remarked that "Large areas of timber have been completely destroyed by forest fires. On all the trips made on Kenai Peninsula we rarely traveled a distance of more than 2 miles without entering a burned area." Bennett also reported that "At Kenai we were told that a big fire went over the country from the head of Tustumena Lake to the mountains in 1890. This same area had been previously burned, probably by the Russians, but there had been substantial reproduction at the time of the big fire in 1890."

Lucas (32) observed that "Native tradition indicates that the Western Kenai country was quite extensively burned over and the moose appeared shortly thereafter." The date when the moose were believed to have become native to the peninsula was given by Lucas as some time between sixty and one hundred years ago. This might be regarded as meaning that a big fire occurred some time between about 1830 and 1870.

In 1933, Palmer, with Dufresne and Lucas, spent about two weeks in a reconnaissance of the moose range on the Kenai Peninsula. In his report (42) dealing with conditions in the region between Skilak and Tustumena Lakes, Palmer stated that "Most of the lower area was burned over about fifty years ago (reported 1883)" In another report (43) he stated that "There were three fires, the first occurring in 1871, the second in 1891, and the third in 1910." Dufresne (18) regarded 1883 as the year of the fire following which moose (said to have been practically unknown up to that time) appeared.

Evidence of past fires may be seen in the forest communities of the Kenai Peninsula today. This evidence is in the form of fire scars on trees and in relatively even-aged forest stands. In addition, charcoal can be found in the soil of practically every upland forest site. Virtually no upland situations below timberline seem to have escaped fire at some time in the past. It is likely that forest fires have occurred on the Kenai ever since there were forests.

There seems little reason to label any of the fires within historic times as "first" fires. Even though no written record of any fire earlier than 1851 has come down to us, there is no reason to believe that such did not occur. Climatic conditions and the nature of the forest on the Kenai Peninsula both favor the extensive spread of fires once they are started. Fires must have been started by lightning and by human beings long before 1851, just as they are today. If fires were essential to set the stage for the appearance of moose on the Kenai Peninsula there is every reason to believe that the stage was already set, centuries ago.

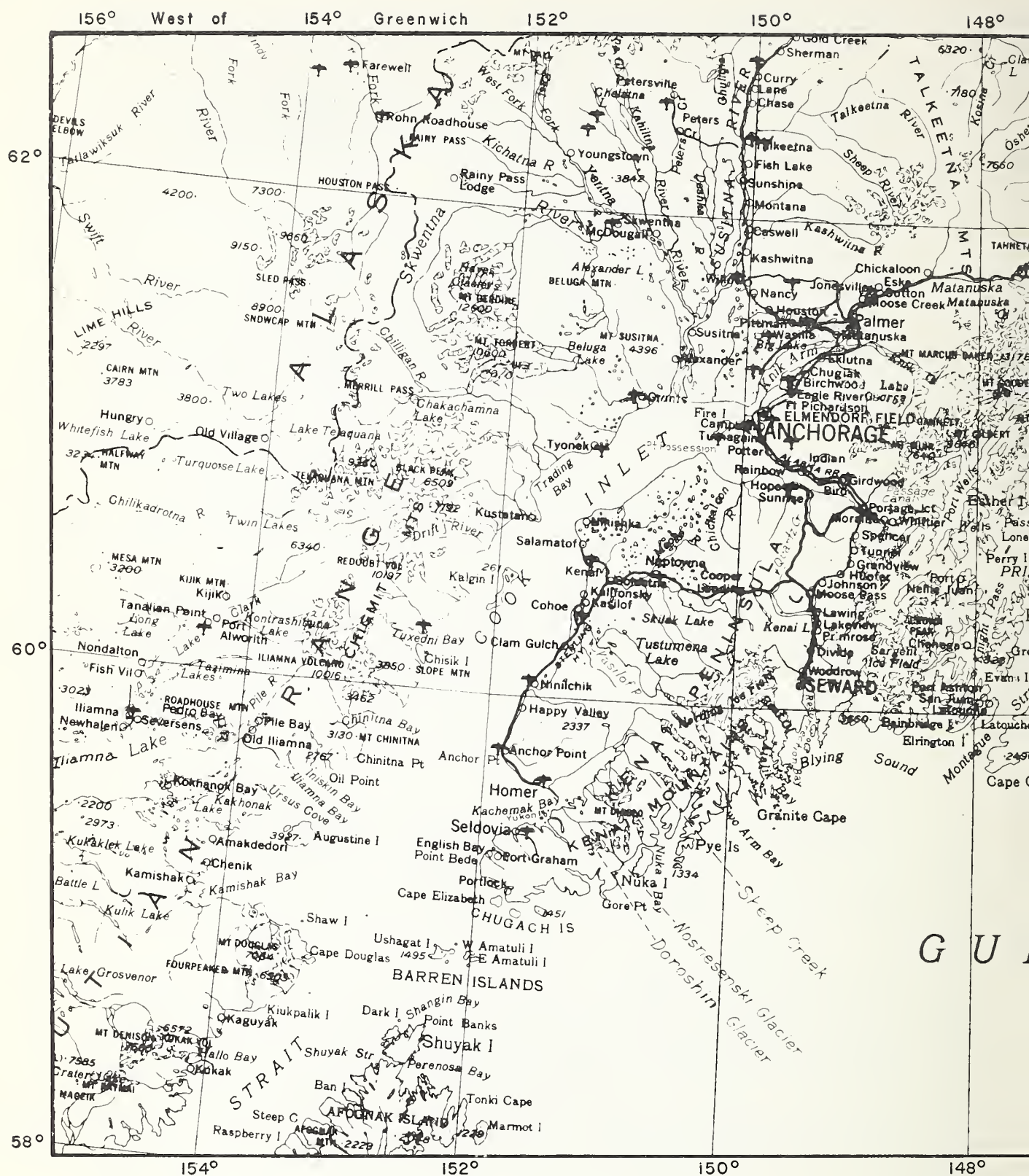
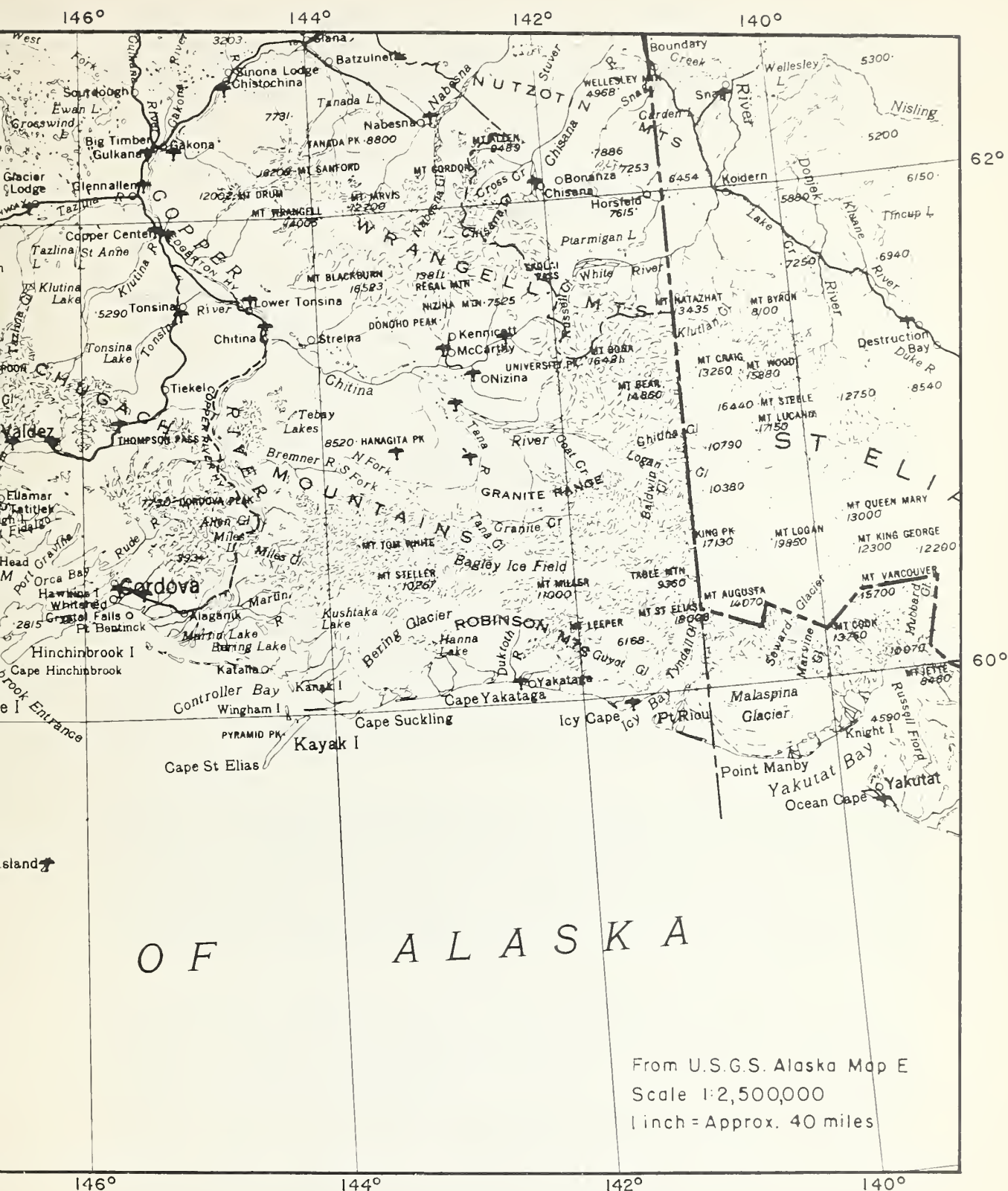


Figure 5.--Map of the Cook Inlet, Kenai P



Prince William Sound area of Alaska.



Figure 5.--Map of the Cook Inlet, Kenai Peninsula, Prince William Sound area of Alaska.

ALLEGED LATE ARRIVAL OF MOOSE IN ALASKA

The tradition that moose were comparatively late arrivals on the Kenai Peninsula is paralleled by the view, expressed by some writers, that moose are comparatively recent arrivals in Alaska as a whole.

Nelson and True (37) reported that "The fur traders and Indians claim that the Moose has been found west of Fort Yukon only within the last twenty-five or thirty years, and that only within the last ten years have they been killed below Anvik and Mission, on the Lower Yukon."

De Weese (16), as mentioned previously, thought the appearance of moose in western Alaska had been very recent. He wrote: "My idea of their migration to this country is that it occurred about the time of the Cascar [Cassiar] gold excitement in British Columbia, which was some twenty eight years ago, when some fifteen to twenty thousand miners and prospectors invaded that territory. This section was a great moose country at that time, and I believe they migrated down Lake Teslyn, the Hoodalinker [Teslin River], over on the headwaters of the Yukon, down to the White, up over the Divide to the head of the Copper River, Tanana and Sushitna, down this stream to the head of Cook's Inlet, where they could neither [evidently a typographical error; either must have been intended] cross over to the head of the Kuscokwim northwesterly or southwesterly to the Kenick [Knik] then finally to the Kenai Peninsula"

Beach, in a section prepared for the volume on "North American big game" (20), expressed the view that "It has been but a comparatively short period of time since Moose first appeared in Alaska." Camp (11) likewise regarded moose as a recent arrival, stating "It is a comparatively recent citizen of Alaska"

The basis for the view that moose first appeared in Alaska in comparatively recent time is not known. In the section that follows evidence will be presented that calls into question the validity of the opinion itself.

EVIDENCE OF EARLY OCCURRENCE OF MOOSE IN ALASKA

The earliest published reference to moose in Alaska known to me is that of La Pérouse (27) in 1797. La Pérouse visited the Alaska coast in 1786. He surveyed Lituya Bay. In Lituya Bay, (which he named Port des Français) in July 1786, he reported (p. 190; 199-200) seeing tanned moose skin. He also saw an Indian chief wearing a garment of tanned moose skin. An anonymous author in 1927 (3), writing of the Alaskan adventures of La Pérouse, translated the French orignal or élan as "elk" (the European term for moose) and then inserted the interesting footnote; "This was evidently either caribou or deer: cervus alces is only now being introduced into Alaska by Alaska Game Commission."

Davydov and Khvostov, Russian naval officers, made two voyages to Russian America (Alaska) in 1802-1804 and 1804-1807. In volume two of Davydov's report (14, p. 131) is a statement that may be freely translated: "In the summer the Kenaian are sent . . . to barter for animal hides and dressed skins of deer and moose with tribes that are not known to the Russians." On page 136-137 it was reported that "The Kenaian trade with the Copper River people and barter . . . dressed skins of moose and other goods."

Wrangell (71, p. 99) stated that the natives of the Copper River region still caught moose that strayed to them, using the animals for their own clothing and for sale. In a section entitled "Notiz über den Kupferfluss" he reported (p. 166) that moose occur in the entire Copper River basin.

Laurentii A. Zagoskin made trips along the Yukon and Kuskokwim River in 1843 and 1844. Several publications reporting his travels make specific references to moose (73, Vol. 84, No. III, pages 17, 20, and 28, and Vol. 85, No. III, pages 12, 15, 22, 25, 128, 134, and 136); (74, pages 623 and 625); (75, Vol. 1, pages 135, 138, and 146, and Vol. 2, pages 53, 56, 63, 66, 94, 100, and 102; and (76, pages 439, 444, 449, and 453). On the Yukon (Kwichpak) River, well above Nulato, his party found a young moose apparently killed during the previous flood period. He recorded that the natives on the upper course of the Minchotljatno (a tributary to the Yukon that cannot be further identified) depended on caribou and moose hunting and that natives of the tribe Noggoj-Khotana (in the region of the present town of Ruby, on the Yukon) occupied themselves with moose and caribou hunting in the winter. Zagoskin reported large herds of caribou and moose on the Innoko River and observed that the native tribes on the lower Koyukuk River, and others, made their summer clothes of both caribou and moose. On the Kuskokwim River, in the country between the present villages of Georgetown and Sleetmute, he reported the whole region well supplied with feeding areas for caribou and moose, and that the natives living on the upper Kuskokwim (Tytschananika) killed caribou, moose, and beaver. He also referred to the use of dogs in hunting moose and to the use of moose-fat in making tolkusha, a favorite native dish.

A long familiarity of the Indians of the Lower Yukon River, between Nulato and Anvik, with moose is indicated by various words in their language. Schott (58) listed a number of Inkilik words relating to moose that were obtained by Zagoskin in 1844. It is interesting that there is a close similarity of the Inkilik word for moose (ttanika) and the Kenaian words for moose reported by Davydov (tanakä) and by Doroschin (ttanakē).

Captain W. A. Howard, U. S. Revenue Steamer Lincoln, reported (23) "deer and moose, with all northern game" on the Alaska Peninsula. Whympers (68) wrote that "This part of the river [the Yukon above the mouth of the Tanana] abounds with moose; both the Indians and ourselves shot several." The same writer noted that at the Hudson's Bay Company post at Fort Yukon "Moose-meat, fresh and dried, is their staple diet" (68, p. 232). When Whympers reached Fort Yukon he observed that "Each man, on arrival at the Fort, received a present of a plug of tobacco and a pipe; and those who had no provisions, drew a daily allowance of moose meat during their stay from the supplies at the post (69).

Raymond (53) reported moose were abundant on the upper Yukon River in 1869 but rarely found below Nulato, although one was killed on an island near the mouth of the Yukon in 1869. In a later report (54) he mentions the occurrence of moose on the Anvik River (p. 171), the Tanana (p. 176), and the Porcupine (p. 178). Turner (67) reported that "The Yukon District and the headwaters of the Tanana, Kuskokwim, and the Nushagak Rivers are scenes of abundance of moose at all seasons."

John Bremner's diary of a trip up the Copper River in 1884, published by Seton-Karr (60, pp. 202-221), makes several references to moose. On September 3rd, Bremner mentions a moose killed (at a point presumably about 10 miles below the mouth of the Bremner River) by the natives, and later a herd of moose in which he wounded but lost an animal. Allen noted (4, p. 128), in his trip up the Copper River, that occasionally a party of natives went down to the Bremner River to hunt moose. Pinart (49) mentioned the fact that the Copper River natives had a word for moose (tnigi) as well as for caribou ('gnai). Lockhart (31), writing of conditions in 1865, stated that "In the valley of the Yukon, and on the west side of the Rocky Mountains, Moose are particularly numerous, and continue so westward to Bering Strait. There are particular localities, however, where Moose are rarely, if ever, seen."

Murray's "Journal of the Yukon, 1847-48" (36) states that: "For moose, I believe this country to be unequaled during the spring (March and April), it only requires a good hunter and a gale of wind to kill an animal when it is required" (p. 80). Writing in the spring of 1848 Murray reported (p. 99): "We have subsisted [at Fort Yukon] all spring . . . upon fresh moose meat, and there is left, well packed with snow in the cellar fresh provisions more than will support the people left until our return. Upwards of thirty moose large and small (but all lean) were killed during winter and spring, by the hunters brought with me and one or two of the natives"

Some writers regard the occurrence of moose on the north slope of the Brooks Range as a recent development, reflecting a more or less general northward movement. However, Rausch (52) stated that, "Moose have been known at Umiat for a long time, and in the summer are found as far north as the mouth of the Colville. In the winter, however, they are rarely found beyond the mouth of the Anaktuvuk." Rausch observed that moose are reported to be extending their range north in Canada and remarked, "According to the Nunamiut, however, moose have long been known along the Colville, since their fathers and grandfathers hunted them there, and their occurrence in this region does not represent a recent extension of their range." Rausch points out that the Nunamiut have names for moose of different ages and sexes (seven examples were given) and that these " . . . indicate a long familiarity with the species."

In the light of the evidence presented it seems clear that moose have long been present in Alaska. Just as in the case of the Kenai Peninsula, it seems certain that there must have been fluctuations in the moose population in both time and space. It is possible, and perhaps probable, that local scarcity or absence were viewed as evidence of general scarcity or absence. This would not be surprising in the early period of written history in Alaska when much of the country was unknown or only poorly known, and when records were few and generally concerned limited areas.

VIEWS ON THE MOVEMENTS OF MOOSE

That moose have appeared, within historic time, in various regions where formerly they were unknown seems to be accepted as established fact. Several accounts of shifts in range have already been presented in the sections dealing with the tradition of a late arrival of moose on the Kenai Peninsula and with the alleged late arrival of the animal in Alaska. The literature concerning moose in other parts of the North affords additional similar observations.

Nelson and True (37) noted that "They (Alces Americanus Jardine) lead a roaming life, and where they may be numerous one season none may be found the next." Pike (48) wrote that "Twenty-five years ago there were very few moose along the Liard, and the animal was unknown to the Indians hunting to the westward of Dease Lake Today, the little-known region drained by the Dease, the Upper Liard, the Frances, and the Pelly, is probably the best moose country on the continent of North America." Bell (6) stated that "The moose or American elk (Alces americanus) migrates slowly from one large area to another through periods extending over many years." In a section prepared by Stone in "The deer family" (55), one learns that "They [moose] are now numerous in a very large territory in northwest British Columbia, through the Cassiar Mountains, on Level Mountain, and throughout the head waters of the Stickine River, where thirty years ago they were unknown." MacFarlane (33), writing of the northern Mackenzie River District, stated that ". . . it has been noticed that at intervals, and for several years at a time, this animal [moose] has been rather scarce in various sections where it had formerly been fairly abundant." Simpson (63) reported the occurrence of moose on the lower Mackenzie River in

1837 and 1838. Williams (70, p. 132) wrote that: "Thirty years ago there were not many moose in British Columbia. There may have been a few in East Kootenay at that time, but in the north, where there are so many now, they were a rare animal, even if any at all existed."

Seton (59) in a section entitled "The drift of moose", observed that, "There is one peculiarity of the Moose range that is unique, at least among our Deer. Many observers state that Moose are now found in such and such a large region where formerly they were unknown. It has always seemed to me more likely that in these cases Moose are now common where formerly rare." However, Seton felt that the statements of shifts in range, many of them from reliable persons, could not be ignored, and proceeded to report a considerable number of observations relative to the appearance, in abundance, of moose in regions where they were previously unknown.

Nesham, presumably referring to conditions before 1913, reported (38), that "Moose were seen as far north as the Firth River" and Brooks (9), with two Eskimos, killed a bull moose at Cape Prince of Wales on the Seward Peninsula in Alaska, in 1948. The locality where Brooks killed the animal " . . . is separated from the periphery of normal habitat for moose by nearly two hundred miles of mountains and arctic tundra."

Peterson (44) discussed the post-glacial dispersal of moose in North America and expressed the opinion that "Concerning the fact that there have been recent general movements or invasions of moose there can be little doubt. Undoubtedly there was some oscillation in the lines of these dispersal fronts and perhaps even previous waves of invasion, but all available evidence seems to discount any earlier major immigration into these unoccupied areas, at least within historic time."

How are the movements of moose to be explained? It is evident that this question has no single, general answer. Even when consideration of the problem is directed to specific regions it appears that conjecture is frequently more common than certainty.

von Wrangell (72, p. 266) described a situation in Siberia in the following words: "The Philippowka is a rapid stream which rises in the White Rocks, and empties itself into the Kolyma. . . . its valley used to be famous for numerous elks [moose], until the great forest fires of 1770 drove them away. They gradually returned as the trees began to grow again, and in the winter of 1812, almost every hunter killed as many as six. Perhaps too many were thus destroyed, as they have been extremely rare ever since; even a single elk [moose] being seen in the Kolymsk district is now quite an event."

Köppen (24), in discussing the movements of moose in European Russia, accepted the opinion of Kawelin that large fires in the 1850's led to the immigration of moose to the Wladimir region. Köppen reported (p. 222) that many persons regarded the forest fires in different parts of Russia as the principal cause for the emigration of moose. In ancient time, too, this cause apparently resulted in similar movements of the animal. Köppen recognized (p. 234) that a whole complex of causes might have been operating simultaneously on movements and listed such factors as meteorological conditions, deficiency of food, persecution by enemies, disturbance to habitat resulting from drying up of bogs, destruction of the forests, and forest fires. He noted, however, that there are always other influences which, in the present state of our knowledge, are not well understood.

Stone (64) accepted the view that movements of moose occurred and believed that "Acquisition of territory by so wary an animal as the moose can only be accounted for in one way. Many years ago the Indian tribes occupying these sections were very numerous and inimical to moose life, but, since the Indians

have dwindled from thousands to insignificant numbers, the moose finds comparatively unmolested life. This I know to be the case on the Kenai."

Seton (59) reported that one observer in Canada traced the increase of moose around Lake Clair, Province of Quebec, to escape of that region from forest fires that burned in the adjacent country. Another observer, in British Columbia, regarded deforestation by fires as having an opposite effect--they favored the increase in moose on Telegraph Creek by providing abundant willow browse.

Palmer (43), writing of the Kenai Peninsula, stated that "In 1898 the King County miners came in and scattered poison, which resulted in killing out all fur bearers, including even the lynx. Following the poisoning, which destroyed the wolves, the moose came in abundantly A further and major factor in bringing in an abundance of moose was the occurrence of fire, which, by removing the heavy forest cover permitted the growth of shrub and other forage species highly palatable to moose."

Leopold and Darling (30, p. 87) postulated ". . . that the recent spread of moose into predominantly tundra areas must be correlated with the gradual Holarctic warming that is known to have occurred in the past half century."

Peterson (44) believed that "Certainly man's disturbances of the habitat through logging and burning played a major part in the sudden speed of dispersal in some areas."

Observations by many reliable persons lead one to the conclusion that moose are peculiarly subject to movements or shifts in their range. These shifts involve movements from old range to new range or reappearance, in time, in regions earlier abandoned.

The causes for the movements of moose are poorly understood. Habitat changes, such as replacement of late-successional-stage communities by early-stage communities are believed by many to be one of the major causes of movements. Fire and cutting of the forest by man are probably the principal agents bringing about changes in the forest cover; often, but not always, these changes are favorable to moose.

SUMMARY

A comprehensive review, up to about the year 1900, was made of the history of the early occurrence of moose on the Kenai Peninsula and in other sections of Alaska.

The tradition of late arrival of moose on the Kenai Peninsula is of Indian origin. The majority of writers who recounted this tradition placed the date of appearance of moose on the Kenai in the 1880's; a number mentioned the 1870's. Others placed the date much earlier or considerably later.

Evidence of the early occurrence of moose on the Kenai Peninsula has been reviewed. This evidence is derived from a variety of sources; reports by the Russians and other travelers who visited the region; the language of the Kenaian which included words for moose as well as caribou; and discovery of moose bones in an ancient native village site on Yukon Island, in Kachemak Bay. On the basis of the evidence it appears that the view that moose first made their appearance on the Kenai Peninsula in 1871, or later, is untenable. Fluctuations in the moose population certainly occurred and it may be that local scarcity, or absence, led to reports of scarcity or absence on the Peninsula as a whole.

Occurrence of forest fires has frequently been advanced as a cause of the movements of moose. The history of early forest fires on the Kenai Peninsula has been reviewed. Although the written record of forest fires on the Kenai Peninsula is scanty (the first written record of a fire being 1851) evidence of past burning may be seen in the forest communities of the Peninsula today. This evidence is in the form of old fire scars on trees and relatively even-aged forest stands. Further, charcoal can be found in the soil of practically every upland forest site. It is likely that forest fires have occurred on the Kenai Peninsula ever since there have been forests. If fires were essential to set the stage for the appearance of moose on the Kenai Peninsula there is every reason to believe that the stage was already set, centuries ago.

The tradition that moose were comparatively late arrivals on the Kenai Peninsula is paralleled by the view occasionally expressed, that moose are comparatively recent immigrants to Alaska as a whole. The basis for this view is not known.

In the light of the evidence presented it seems clear that rather than being comparatively recent arrivals in Alaska, the animals have long been present in the region.

Observations by many reliable persons lead to the conclusion that moose are peculiarly subject to movements or shifts in their range. These shifts involve movements from old range to new range or reappearance, in time, in regions earlier abandoned. The causes for these movements are poorly understood. Habitat changes, such as replacement of late-successional-stage communities by early-stage communities are believed by many to be one of the major causes of movements. Fire and cutting of the forest by man are probably the principal agents bringing about changes in the forest cover. Often, but not always, they are favorable to moose. Other suggested causes of movements are favorable or unfavorable climatic conditions, excessive hunting pressure, and animal predators or insect pests. In many situations the real causes are unknown and may only be conjectured.

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